



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS
RESEARCH LABORATORY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
RESEARCH AND DEVELOPMENT

CROFTON, 1998a

MEMORANDUM

Date: 18 October 1998 (revised 21 November 1998)

Subject: Analysis and Graphics of Thyroid Hormone Data from the Rat 14-Day
"Caldwell" Perchlorate Study

From: Kevin M. Crofton Neurotoxicology Division, MD-74B
National Health Effects and Environmental Research Laboratory

To: Annie Jarabek
National Center for Environmental Assessment

Attached is the statistical analysis of the data from the Rat 14-Day Study conducted by WPAFB . I have attached a short description of how the analysis was done, a summary graph, and a table that summarizes the noels for all the endpoints.

The revised version dated 11/21/98 incorporates all the comments supplied by both you and Andrew Geller.

Note: The raw data used for this analysis had not been submitted to the Agency at the time of this revised memo.

Analyses of Thyroid Hormone and Thyrotrophin Data from the WPAFB 14-Day Rat Perchlorate Study

Summary: The rat 14-day perchlorate dosing study conducted by WPAFB is summarized in two reports Caldwell et al. (1995) and King (1995). Following is a statistical analysis of the hormone data (T4, thyroxine; T3, triiodothyronine; rT3, reverse T3; TSH, thyroid stimulating hormone; and, hTG, thyroglobulin) found in these reports. This data was re-analyzed using five two-way ANOVAs, one each for all of the hormones. Results of these re-analyses are similar to those stated in the reports, with some notable exceptions (see below). As expected perchlorate exposure decreased circulating T3 and T4, increased TSH. These reports also provides evidence that rT3, formed mostly in extrathyroidal tissues increased. hTG was also increased. There was no NOEL established by this study. The lowest dosage of 0.11 mg/kg/day was a LOEL for T4, T3 and hTG.

Data Source: All data were supplied by Dr. David Mattie, AFRL/HEST, Wright-Patterson AFB in Microsoft Excel spreadsheets. Data were exported to ascii format and used as input for SAS analyses. Data from dependent measure (T3, T4, rT3, TSH, hTG) were subjected to separate two-way ANOVAs, with Gender (male and female), and Treatment (dose) as independent between-subjects variables. Step-down ANOVAs were conducted as indicated by significant interactions. Mean contrasts were performed using Turkey's Studentized Range (HSD) Test. To correct for multiple comparisons (i.e., five separate two-way ANOVAs) the acceptable alpha for significance (for all interaction main effects tests) was corrected to 0.0224 (alpha of 0.05 divided by the square root of the number of dependent variables). SAS analysis code and output are attached.

Data Analysis - Results:

Total Serum Thyroxine (T4): The overall Gender*Treatment interaction was not significant, but there was a significant main effect of treatment. Therefore, data from males and females were combined for all subsequent analyses. These data are plotted in Figure 1. Figure 1 clearly indicates that perchlorate decreases T4 in a dosage-dependent manner.

Total Serum Triiodothyronine (T3): There was a significant Gender*Treatment interaction and subsequent step-downs ANOVAs showed significant Treatment effects for both Genders. Figure 2 illustrates dosage-dependent decreases in T3 for both Genders. Females were slightly more sensitive compared to males.

Thyroid Stimulating Hormone (TSH): There was a significant Gender*Treatment interaction and subsequent step-down ANOVAs showed significant Treatment effects for both Genders. Figure 3 illustrates dosage-dependent increases in TSH for both Genders. Females were slightly more sensitive compared to males.

Reverse Triiodothyronine (rT3): There was a no significant Gender*Treatment interaction, but there was a significant main effect of treatment. Therefore, data from males and females were combined for all subsequent analyses and plotted in Figure 4. Figure 4 clearly indicates that perchlorate increases rT3 in a dosage-dependent manner.

Thyroglobulin (hTG): There was a significant Gender*Treatment interaction and subsequent step-down ANOVAs showed significant Treatment effects for both Genders. Figure 5 illustrates the dosage-dependent increases in hTG for both Genders. Both Genders were equally sensitive, with males exhibiting a slightly greater response to the lowest dosage.

REFERENCES

- 1) Caldwell, D.J., King, J.H. Jr., Kinkead, E.R., Wolfe, R.E., Narayanan, L., and Mattie, D.R. 1995. Results of a Fourteen Day Oral-Dosing Toxicity Study of Ammonium Perchlorate. In: Proceedings of the 1995 JANNAF Propulsion and Subcommittee Joint Meetings. December 1995, Tampa, FL. Joint Army, Navy, NASA, Air Force (JANNAF) Interagency Propulsion Committee Publication 634, Chemical Propulsion Information Agency, Columbia MD, pp. 179-184.
- 2) King, J.H. (1995) Effects of ammonium perchlorate on the thyroid hormone levels of the Sprague-Dawley rat [thesis]. Air Force Institute of Technology; AFIT/GEE/ENV/95D-09.

Table 1. Summary of NOAELs (mg perchlorate/kg/day - estimated from water consumption data) for the Caldwell 14-day perchlorate study.

	T4	T3	TSH	rT3	hTG
females	0.11*	0.12*	0.11	0.17	0.12*
males	0.11	0.11	0.44		0.11*

* = LOAEL, no NOAEL was defined

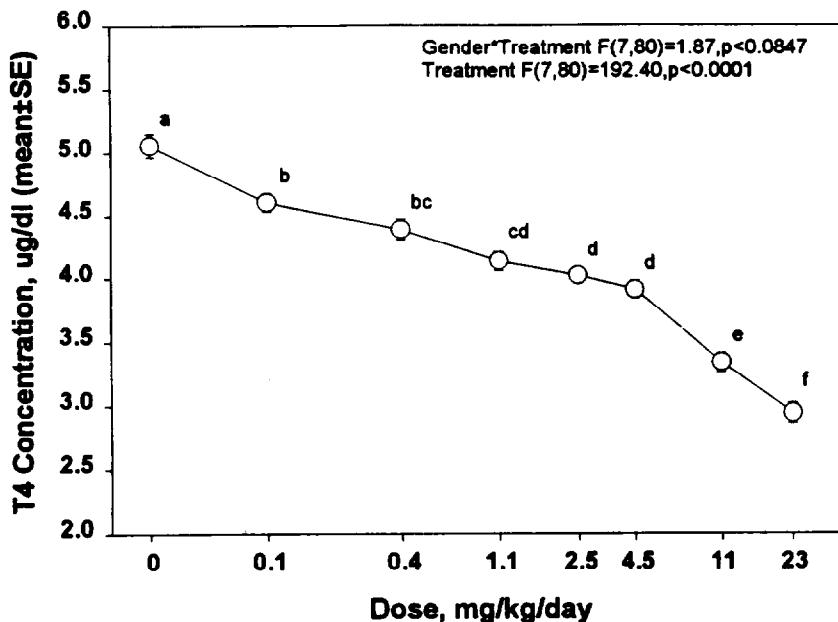


Figure 1. Effects of 14-day exposure to perchlorate on serum total thyroxine (T4) concentrations. There was no Gender*Treatment interaction, but there was a main Treatment effect, therefore data were collapsed across gender. Means with different letters were significantly different ($p<0.05$, Tukey's after significant main effect). Daily dose was estimated from water consumption data.

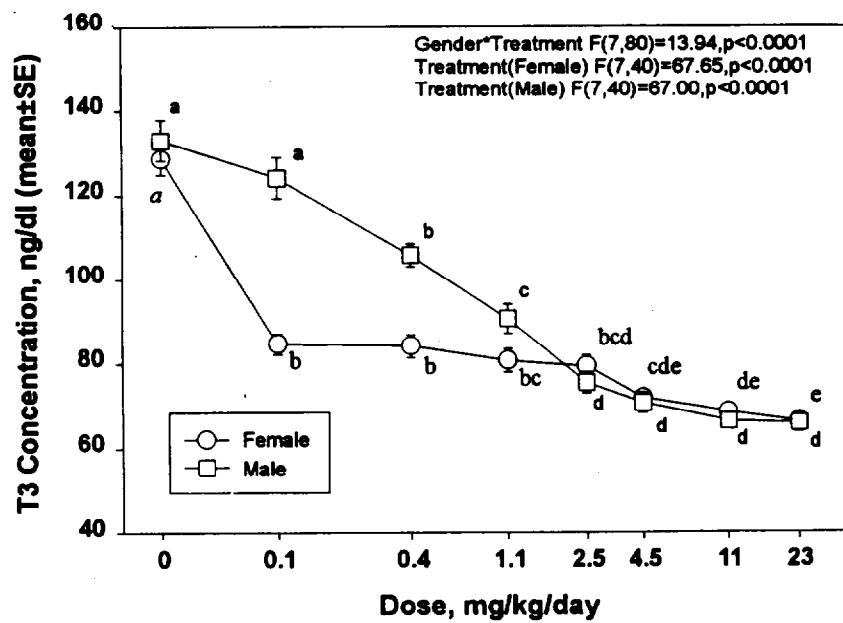


Figure 2. Effects of 14-day exposure to perchlorate on serum total triiodothyronine (T3) concentrations. There was a significant Gender*Treatment interaction, and significant Treatment effects for both Genders. Therefore data were plotted separately by Gender. Means with different letters were significantly different ($p<0.05$, Tukey's after significant main effect). Daily dose was estimated from water consumption data.

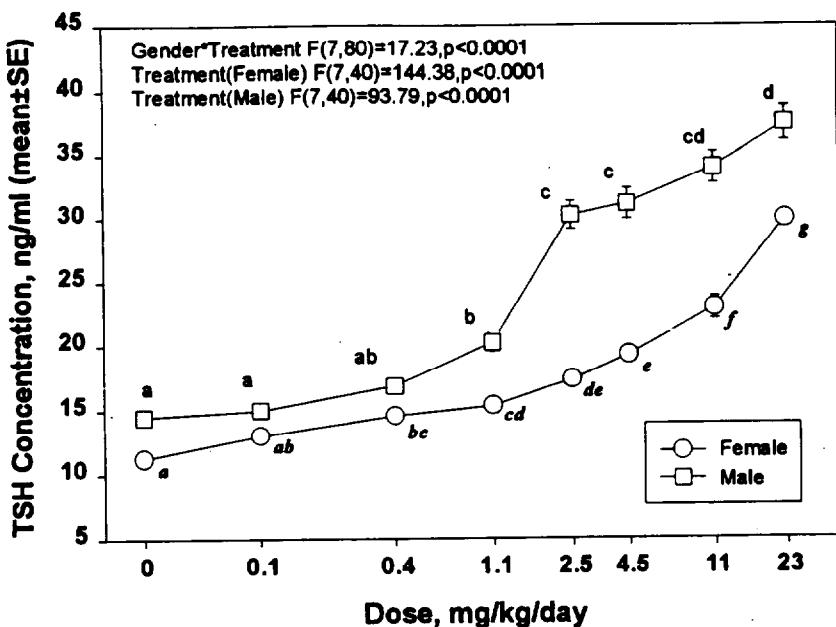


Figure 3. Effects to perchlorate on stimulating hormone (TSH) concentrations. There was a significant Gender*Treatment interaction, and significant Treatment effects for both Genders. Therefore data were plotted separately by Gender. Means with different letters were significantly different ($p<0.05$, Tukey's after significant main effect). Daily dose was estimated from water consumption data.

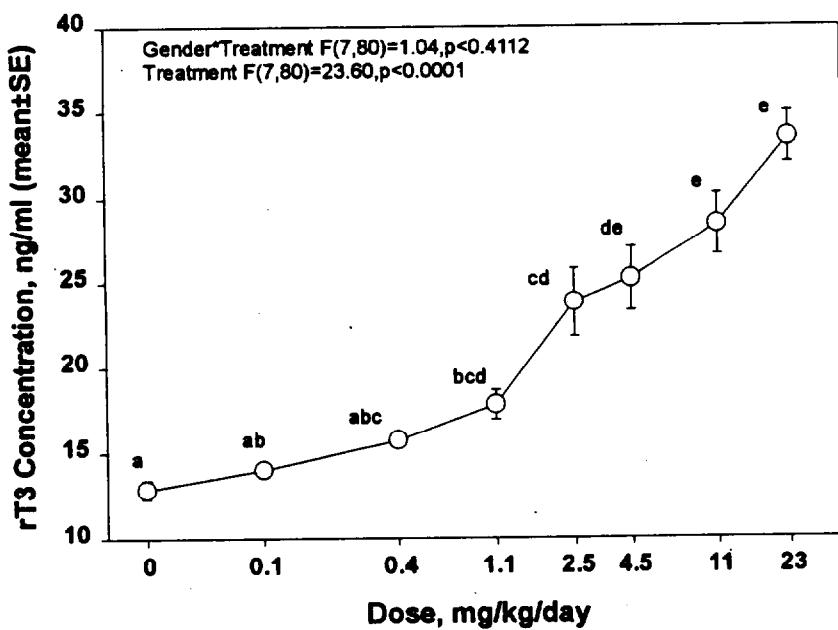


Figure 4. Effects of 14-day exposure to perchlorate on serum reverse triiodothyronine (rT3) concentrations. There was no Gender*Treatment interaction, but there was a main Treatment effect, therefore data were collapsed across gender. Means with different letters were significantly different ($p<0.05$, Tukey's after significant main effect). Daily dose was estimated from water consumption data.

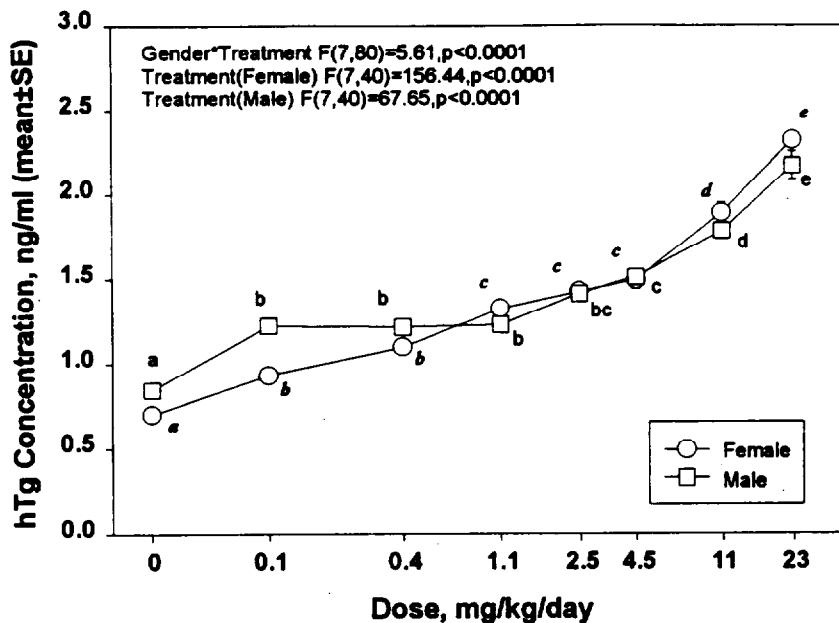


Figure 5. Effects of 14-day exposure to perchlorate on serum thyroglobulin concentrations. There was a significant Gender*Treatment interaction, and significant Treatment effects for both Genders. Therefore data were plotted separately by Gender. Means with different letters were significantly different ($p<0.05$, Tukey's after significant main effect). Daily dose was estimated from water consumption data.

11 The SAS System 17:12 Tuesday, October 6, 1998

NOTE: Copyright (c) 1989-1996 by SAS Institute Inc., Cary, NC, USA.
NOTE: SAS (r) Proprietary Software Release 6.12 TS020
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NOTE: Running on ALPHASERVER Model 2100 5/300 Serial Number 80000000.

Welcome to the NHEERL-RTP SAS Information Delivery System.

```

1 *THIS FILE IS FOUND AT [CROFTON.THYROID.perchlorate]perchlorate_14day.SAS;
2 *IT ANALYZES THE THYROID HORMONE DATA FROM THE WPAFB 14 DAY PERCHLORATE STUDY;
3
4
5 *INPUT DATA INTO SAS DATASET;
6 DATA RAW; INFILE '[CROFTON.THYROID.PERCHLORATE] PERCHLORATE_14DAY.DAT';
7     INPUT WPAFB $ 1-10 ANIM DOSE $ SEX$ htG rT3 T4 T3 TSH;
8
9 *ASSIGN DOSAGE VALUES TO TREATMENT CODES;
10    IF DOSE = '0' THEN TRT = '1-----CONTROL';
11    IF DOSE = '1.25' THEN TRT = '2-1.25_mg/kg/day';
12    IF DOSE = '5' THEN TRT = '3---5_mg/kg/day';
13    IF DOSE = '12.5' THEN TRT = '4-12.5_mg/kg/day';
14    IF DOSE = '25' THEN TRT = '5---25_mg/kg/day';
15    IF DOSE = '50' THEN TRT = '6---50_mg/kg/day';
16    IF DOSE = '125' THEN TRT = '7--125_mg/kg/day';
17    IF DOSE = '250' THEN TRT = '8--250_mg/kg/day';
18
19
20

```

NOTE: The infile '[CROFTON.THYROID.PERCHLORATE]PERCHLORATE 14DAY.DAT' is:
File=DSA21:[SASSUSERS.CROFTON.THYROID.PERCHLORATE]PERCHLORATE 14DAY.DAT

NOTE: 96 records were read from the infile '[CROFTON.THYROID.PERCHLORATE]PERCHLORATE_14DAY.DAT'
The minimum record length was 78.

The maximum record length was 79.
NOTE: The data set WORK RAW has 96 observations and 10 variables

```
21      PROC PRINT;  
22  
23  
24      *SORT DATA BY TRT /;  
25  
26
```

NOTE: The PROCEDURE PRINT printed pages 1-2.

26 PROC SORT; BY TRT SEX;
27

NOTE: The data set WORK.RAW has 96 observations and 10 variables.

```
27 PROC MEANS N MEAN STDERR MIN MAX STD VAR CV; BY TRT SEX;  
28           VAR hTg rT3 T3 T4 TSH;  
29  
30
```

12

The SAS System

17:12 Tuesday, October 6, 1998

NOTE: The PROCEDURE MEANS printed pages 3-6.

```
30      PROC SORT; BY TRT;  
31
```

NOTE: Input data set is already sorted, no sorting done.

```
31      PROC MEANS N MEAN STDERR MIN MAX STD VAR CV; BY TRT;  
32          VAR hTg rT3 T3 T4 TSH;  
33  
34  
35      *RUN TWO WAY ANOVAs - SEX*TRT - FOR ALL VARIABLES;  
36
```

NOTE: The PROCEDURE MEANS printed pages 7-8.

```
36      PROC SORT; BY SEX TRT;  
37
```

NOTE: The data set WORK.RAW has 96 observations and 10 variables.

```
37      PROC GLM;  
38          CLASSES SEX TRT;  
39          MODEL hTg rT3 T3 T4 TSH = SEX|TRT;  
40          TITLE1 "WPAFB 14-DAY PERCHLORATE - ALL VARIABLES";  
41          TITLE2 "PROC GLM - SEX BY TRT INTERACTIONS";  
42  
43      *STEPDOWN ANOVAS BY GENDER FOR hTg, T3 and TSH;  
44
```

NOTE: The PROCEDURE GLM printed pages 9-14.

```
44      PROC SORT; BY SEX;  
45
```

NOTE: Input data set is already sorted, no sorting done.

```
45      PROC GLM; BY SEX ;  
46          CLASSES TRT;  
47          MODEL hTg T3 TSH = TRT;  
48          MEANS TRT/TUKEY LINES;  
49          TITLE1 "WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA";  
50          TITLE2 "PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT";  
51  
52      *STEPDOWN ANOVAS -DATA COLLAPSED ACROSS GENDER - FOR rT3 and T4;
```

NOTE: The PROCEDURE GLM printed pages 15-28.

```
53      PROC SORT; BY TRT;
```

NOTE: The data set WORK.RAW has 96 observations and 10 variables.

```
54      PROC GLM;  
55          CLASSES TRT;  
56          MODEL rT3 T4 = TRT;  
57          MEANS TRT/TUKEY LINE;  
58          TITLE1 "WPAFB 90-DAY PERCHLORATE K0799 - rT3 and T4 DATA";  
59          TITLE2 "PROC GLM - MAIN EFFECT OF TRT";
```

13

The SAS System

17:12 Tuesday, October 6, 1998

60

61

62 ENDSAS;

NOTE: The PROCEDURE GLM printed pages 29-33.

NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414

1

The SAS System

17:12 Tuesday, October 6, 1998 1

OBS	WPAFB	ANIM	DOSE	SEX	HTG	RT3	T4	T3	TSH	TRT
1	68_Conto	68	0	F	0.69	7.87	4.49	124.33	10.92	1-----CONTROL
2	71_Conto	71	0	F	0.68	8.26	4.50	138.36	10.71	1-----CONTROL
3	86_Conto	86	0	F	0.80	8.27	5.36	127.89	12.01	1-----CONTROL
4	90_Conto	90	0	F	0.67	8.12	5.36	133.14	11.40	1-----CONTROL
5	95_Conto	95	0	F	0.65	8.06	4.94	134.17	10.96	1-----CONTROL
6	100_Contr	100	0	F	0.70	7.77	5.33	113.17	11.49	1-----CONTROL
7	51_1.25mg	51	1.25	F	0.92	8.87	4.41	93.91	11.96	2-1.25_mg/kg/day
8	55_1.25mg	55	1.25	F	0.81	8.81	4.37	75.70	11.71	2-1.25_mg/kg/day
9	58_1.25mg	58	1.25	F	0.97	8.75	4.47	84.17	14.74	2-1.25_mg/kg/day
10	67_1.25mg	67	1.25	F	1.00	8.37	4.37	85.04	13.42	2-1.25_mg/kg/day
11	73_1.25mg	73	1.25	F	0.96	8.91	4.13	86.66	13.68	2-1.25_mg/kg/day
12	84_1.25mg	84	1.25	F	0.93	8.49	4.69	82.11	12.81	2-1.25_mg/kg/day
13	53_5mg/L	53	5	F	1.12	8.73	4.19	83.60	13.58	3---5_mg/kg/day
14	56_5mg/L	56	5	F	0.99	9.09	4.13	79.01	13.72	3---5_mg/kg/day
15	63_5mg/L	63	5	F	1.13	9.17	4.16	81.13	14.33	3---5_mg/kg/day
16	69_5mg/L	69	5	F	1.18	9.03	4.05	82.39	15.38	3---5_mg/kg/day
17	88_5mg/L	88	5	F	1.00	8.85	4.16	96.90	14.59	3---5_mg/kg/day
18	91_5mg/L	91	5	F	1.17	8.89	4.03	81.41	15.91	3---5_mg/kg/day
19	60_12.5mg	60	12.5	F	1.19	9.41	3.75	94.00	15.45	4-12.5_mg/kg/day
20	66_12.5mg	66	12.5	F	1.35	9.75	3.84	79.42	12.54	4-12.5_mg/kg/day
21	70_12.5mg	70	12.5	F	1.43	9.65	4.11	76.16	16.42	4-12.5_mg/kg/day
22	77_12.5mg	77	12.5	F	1.27	9.13	3.97	77.21	15.93	4-12.5_mg/kg/day
23	92_12.5mg	92	12.5	F	1.30	9.58	4.11	78.67	16.43	4-12.5_mg/kg/day
24	99_12.5mg	99	12.5	F	1.41	8.45	3.92	78.61	15.37	4-12.5_mg/kg/day
25	59_25mg/L	59	25	F	1.26	11.87	3.75	73.91	17.17	5---25_mg/kg/day
26	64_25mg/L	64	25	F	1.47	10.28	3.96	85.00	17.21	5---25_mg/kg/day
27	76_25mg/L	76	25	F	1.40	8.74	3.80	73.47	17.33	5---25_mg/kg/day
28	80_25mg/L	80	25	F	1.57	8.62	3.75	74.16	17.55	5---25_mg/kg/day
29	87_25mg/L	87	25	F	1.45	9.55	4.11	88.61	16.77	5---25_mg/kg/day
30	94_25mg/L	94	25	F	1.41	10.67	3.76	80.65	18.29	5---25_mg/kg/day
31	52_50mg/L	52	50	F	1.32	11.28	3.78	72.41	18.59	6---50_mg/kg/day
32	57_50mg/L	57	50	F	1.52	11.22	3.90	69.97	18.02	6---50_mg/kg/day
33	61_50mg/L	61	50	F	1.61	8.87	3.60	68.61	19.61	6---50_mg/kg/day
34	62_50mg/L	62	50	F	1.62	9.18	3.77	72.37	18.62	6---50_mg/kg/day
35	85_50mg/L	85	50	F	1.36	10.84	3.51	72.10	20.35	6---50_mg/kg/day
36	96_50mg/L	96	50	F	1.52	11.85	3.86	75.70	20.34	6---50_mg/kg/day
37	65_125mg/	65	125	F	1.86	11.11	2.97	73.30	21.47	7---125_mg/kg/day
38	78_125mg/	78	125	F	1.90	9.00	3.49	69.55	26.62	7---125_mg/kg/day
39	79_125mg/	79	125	F	1.94	11.37	3.43	69.20	22.87	7---125_mg/kg/day
40	81_125mg/	81	125	F	1.62	10.89	3.44	68.43	20.03	7---125_mg/kg/day
41	82_125mg/	82	125	F	1.90	11.39	2.84	68.08	22.95	7---125_mg/kg/day
42	93_125mg/	93	125	F	2.11	10.68	3.32	62.72	23.49	7---125_mg/kg/day
43	54_250mg/	54	250	F	2.48	10.95	2.48	63.80	31.15	8--250_mg/kg/day
44	72_250mg/	72	250	F	2.31	12.33	3.10	68.32	30.31	8--250_mg/kg/day
45	74_250mg/	74	250	F	2.34	9.16	3.05	67.39	27.48	8--250_mg/kg/day
46	75_250mg/	75	250	F	2.26	11.00	2.86	68.08	29.91	8--250_mg/kg/day
47	83_250mg/	83	250	F	2.18	10.67	3.29	60.61	30.22	8--250_mg/kg/day
48	89_250mg/	89	250	F	2.36	9.87	2.75	70.21	30.48	8--250_mg/kg/day
49	11_Conto	11	0	M	0.87	7.80	5.19	139.85	14.24	1-----CONTROL
50	15_Conto	15	0	M	0.92	7.80	5.12	141.54	13.76	1-----CONTROL
51	24_Conto	24	0	M	0.81	8.16	5.16	136.13	14.68	1-----CONTROL
52	39_Conto	39	0	M	0.89	8.34	4.98	110.68	13.88	1-----CONTROL
53	44_Conto	44	0	M	0.85	8.32	5.44	129.32	16.69	1-----CONTROL
54	47_Conto	47	0	M	0.73	8.98	4.85	139.67	13.59	1-----CONTROL
55	1_I.25mg/	1	1.25	M	1.22	8.22	4.86	132.68	14.87	2-1.25_mg/kg/day
56	12_I.25mg	12	1.25	M	1.21	8.23	4.79	127.29	15.03	2-1.25_mg/kg/day

OBS	WPAFB	ANIM	DOSE	SEX	HTG	RT3	T4	T3	TSH	TRT
57	14_1.25mg	14	1.25	M	1.35	8.23	4.83	137.89	12.32	2-1.25_mg/kg/day
58	19_1.25mg	19	1.25	M	1.14	8.67	4.73	126.69	15.85	2-1.25_mg/kg/day
59	25_1.25mg	25	1.25	M	1.27	8.80	4.70	106.41	16.70	2-1.25_mg/kg/day
60	27_1.25m	27	1.25	M	1.16	9.54	4.91	113.15	15.35	2-1.25_mg/kg/day
61	9_5mg/L	9	5	M	1.24	8.48	4.57	110.39	17.35	3----5_mg/kg/day
62	13_5mg/L	13	5	M	1.12	8.65	4.67	114.24	16.45	3----5_mg/kg/day
63	21_5mg/L	21	5	M	1.41	10.11	4.56	106.09	16.83	3----5_mg/kg/day
64	29_5mg/L	29	5	M	1.19	8.58	4.78	95.82	16.53	3----5_mg/kg/day
65	42_5mg/L	42	5	M	1.27	9.16	4.66	100.78	16.57	3----5_mg/kg/day
66	48_5mg/L	48	5	M	1.07	8.65	4.73	106.68	17.77	3----5_mg/kg/day
67	17_12.5m	17	12.5	M	1.28	9.17	4.35	99.33	22.88	4-12.5_mg/kg/day
68	20_12.5mg	20	12.5	M	1.19	9.03	4.34	96.77	21.74	4-12.5_mg/kg/day
69	26_12.5mg	26	12.5	M	1.18	9.04	3.92	85.19	18.79	4-12.5_mg/kg/day
70	38_12.5mg	38	12.5	M	1.16	9.11	4.53	98.02	18.45	4-12.5_mg/kg/day
71	41_12.5mg	41	12.5	M	1.30	9.25	4.29	81.90	19.92	4-12.5_mg/kg/day
72	45_12.5mg	45	12.5	M	1.28	9.03	4.49	81.55	19.72	4-12.5_mg/kg/day
73	4_25mg/L	4	25	M	1.27	9.57	4.06	85.83	32.66	5----25_mg/kg/day
74	7_25mg/L	7	25	M	1.36	10.07	4.26	70.56	28.76	5----25_mg/kg/day
75	16_25mg/L	16	25	M	1.42	9.24	4.16	77.17	30.41	5----25_mg/kg/day
76	30_25mg/L	30	25	M	1.45	9.18	4.25	76.22	31.18	5----25_mg/kg/day
77	36_25mg/L	36	25	M	1.43	9.36	4.23	68.55	25.57	5----25_mg/kg/day
78	43_25mg/L	43	25	M	1.55	10.31	4.18	74.16	32.82	5----25_mg/kg/day
79	6_50mg/L	6	50	M	1.42	9.57	3.99	75.99	32.94	6---50_mg/kg/day
80	8_50mg/L	8	50	M	1.51	9.25	4.20	70.02	25.18	6---50_mg/kg/day
81	33_50mg/L	33	50	M	1.35	10.76	3.93	68.79	32.37	6---50_mg/kg/day
82	34_50mg/L	34	50	M	1.60	9.51	4.08	65.96	32.52	6---50_mg/kg/day
83	40_50mg/L	40	50	M	1.58	9.33	4.39	64.02	32.26	6---50_mg/kg/day
84	46_50mg/L	46	50	M	1.60	9.66	3.90	79.37	31.60	6---50_mg/kg/day
85	2_125mg/L	2	125	M	1.85	10.64	3.32	70.73	28.46	7--125_mg/kg/day
86	5_125mg/L	5	125	M	1.80	10.88	3.64	71.03	33.88	7--125_mg/kg/day
87	28_125mg/	28	125	M	1.90	11.45	3.24	64.31	37.13	7--125_mg/kg/day
88	31_125mg/	31	125	M	1.83	12.76	3.70	61.86	33.17	7--125_mg/kg/day
89	32_125mg/	32	125	M	1.76	10.66	3.10	65.23	34.93	7--125_mg/kg/day
90	35_125mg/	35	125	M	1.55	10.85	3.57	65.62	36.19	7--125_mg/kg/day
91	3_250mg/L	3	250	M	1.98	10.22	2.89	64.50	36.37	8--250_mg/kg/day
92	10_250mg/	10	250	M	2.06	11.10	2.69	69.31	33.38	8--250_mg/kg/day
93	18_250mg/	18	250	M	2.04	10.78	2.77	61.90	43.44	8--250_mg/kg/day
94	22_250mg/	22	250	M	2.05	10.72	3.19	59.78	37.43	8--250_mg/kg/day
95	23_250mg/	23	250	M	2.44	13.18	3.26	66.30	38.25	8--250_mg/kg/day
96	37_250mg/	37	250	M	2.46	10.43	2.96	73.82	35.79	8--250_mg/kg/day

1

The SAS System

17:12 Tuesday, October 6, 1998 3

-----TRT=1-----CONTROL SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	0.6983333	0.0215123	0.6500000	0.8000000	0.0526941	0.0027767	7.5456925
RT3	6	8.0583333	0.0832433	7.7700000	8.2700000	0.2039036	0.0415767	2.5303442
T3	6	128.5100000	3.6681848	113.1700000	138.3600000	8.9851811	80.7334800	6.9918147
T4	6	4.9966667	0.1714384	4.4900000	5.3600000	0.4199365	0.1763467	8.4043330
TSH	6	11.2483333	0.1951310	10.7100000	12.0100000	0.4779714	0.2284567	4.2492643

-----TRT=1-----CONTROL SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	0.8450000	0.0275379	0.7300000	0.9200000	0.0674537	0.0045500	7.9826849
RT3	6	8.2333333	0.1786368	7.8000000	8.9800000	0.4375690	0.1914667	5.3146038
T3	6	132.8650000	4.7810576	110.6800000	141.5400000	11.7111515	137.1510700	8.8143240
T4	6	5.1233333	0.0819214	4.8500000	5.4400000	0.2006656	0.0402667	3.9166993
TSH	6	14.4733333	0.4708833	13.5900000	16.6900000	1.1534239	1.3303867	7.9693037

-----TRT=2-1.25_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	0.9316667	0.0270082	0.8100000	1.0000000	0.0661564	0.0043767	7.1008637
RT3	6	8.7000000	0.0895545	8.3700000	8.9100000	0.2193627	0.0481200	2.5214105
T3	6	84.5983333	2.4269891	75.7000000	93.9100000	5.9448849	35.3416567	7.0271892
T4	6	4.4066667	0.0738316	4.1300000	4.6900000	0.1808498	0.0327067	4.1040056
TSH	6	13.0533333	0.4630023	11.7100000	14.7400000	1.1341193	1.2862267	8.6883504

-----TRT=2-1.25_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.2250000	0.0312783	1.1400000	1.3500000	0.0766159	0.0058700	6.2543612
RT3	6	8.6150000	0.2117664	8.2200000	9.5400000	0.5187196	0.2690700	6.0211210
T3	6	124.0183333	4.8766904	106.4100000	137.8900000	11.9454032	142.6926567	9.6319656
T4	6	4.8033333	0.0324208	4.7000000	4.9100000	0.0794145	0.0063067	1.6533211
TSH	6	15.0200000	0.6036776	12.3200000	16.7000000	1.4787021	2.1865600	9.8448877

1

The SAS System

17:12 Tuesday, October 6, 1998 4

----- TRT=3----5_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.0983333	0.0340016	0.9900000	1.1800000	0.0832867	0.0069367	7.5830034
RT3	6	8.9600000	0.0672805	8.7300000	9.1700000	0.1648029	0.0271600	1.8393182
T3	6	84.0733333	2.6392861	79.0100000	96.9000000	6.4649042	41.7949867	7.6896014
T4	6	4.1200000	0.0265832	4.0300000	4.1900000	0.0651153	0.0042400	1.5804680
TSH	6	14.5850000	0.3746532	13.5800000	15.9100000	0.9177091	0.8421900	6.2921433

----- TRT=3----5_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.2166667	0.0491031	1.0700000	1.4100000	0.1202775	0.0144667	9.8858184
RT3	6	8.9383333	0.2534221	8.4800000	10.1100000	0.6207549	0.3853367	6.9448620
T3	6	105.6666667	2.6947748	95.8200000	114.2400000	6.6008232	43.5708667	6.2468358
T4	6	4.6616667	0.0353475	4.5600000	4.7800000	0.0865833	0.0074967	1.8573463
TSH	6	16.9166667	0.2168666	16.4500000	17.7700000	0.5312124	0.2821867	3.1401721

----- TRT=4-12.5_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.3250000	0.0368556	1.1900000	1.4300000	0.0902774	0.0081500	6.8133849
RT3	6	9.3283333	0.1968149	8.4500000	9.7500000	0.4820961	0.2324167	5.1680842
T3	6	80.6783333	2.7068203	76.1600000	94.0000000	6.6303285	43.9612567	8.2182270
T4	6	3.9500000	0.0590480	3.7500000	4.1100000	0.1446375	0.0209200	3.6617083
TSH	6	15.3566667	0.5931254	12.5400000	16.4300000	1.4528547	2.1107867	9.4607423

----- TRT=4-12.5_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.2316667	0.0250887	1.1600000	1.3000000	0.0614546	0.0037767	4.9895472
RT3	6	9.1050000	0.0368556	9.0300000	9.2500000	0.0902774	0.0081500	0.9915140
T3	6	90.4600000	3.4451957	81.5500000	99.3300000	8.4389715	71.2162400	9.3289537
T4	6	4.3200000	0.0885438	3.9200000	4.5300000	0.2168871	0.0470400	5.0205340
TSH	6	20.2500000	0.7047080	18.4500000	22.8800000	1.7261750	2.9796800	8.5243208

1

The SAS System

17:12 Tuesday, October 6, 1998 5

----- TRT=5---25_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.42666667	0.0415264	1.2600000	1.5700000	0.1017186	0.0103467	7.1298060
RT3	6	9.9550000	0.5068382	8.6200000	11.8700000	1.2414951	1.5413100	12.4710705
T3	6	79.3000000	2.6485795	73.4700000	88.6100000	6.4876683	42.0898400	8.1811706
T4	6	3.8550000	0.0605943	3.7500000	4.1100000	0.1484251	0.0220300	3.8501962
TSH	6	17.3866667	0.2085133	16.7700000	18.2900000	0.5107511	0.2608667	2.9376021

----- TRT=5---25_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.41333333	0.0381809	1.2700000	1.5500000	0.0935236	0.0087467	6.6172369
RT3	6	9.6216667	0.1903228	9.1800000	10.3100000	0.4661938	0.2173367	4.8452500
T3	6	75.4150000	2.4797483	68.5500000	85.8300000	6.0741180	36.8949100	8.0542572
T4	6	4.1900000	0.0305505	4.0600000	4.2600000	0.0748331	0.0056000	1.7859940
TSH	6	30.2333333	1.1169054	25.5700000	32.8200000	2.7358484	7.4848667	9.0491128

----- TRT=6---50_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.49166667	0.0512781	1.3200000	1.6200000	0.1256052	0.0157767	8.4204604
RT3	6	10.5400000	0.4984844	8.8700000	11.8500000	1.2210324	1.4909200	11.5847472
T3	6	71.8600000	0.9916384	68.6100000	75.7000000	2.4290080	5.9000800	3.3801949
T4	6	3.7366667	0.0618960	3.5100000	3.9000000	0.1516135	0.0229867	4.0574543
TSH	6	19.2550000	0.4030281	18.0200000	20.3500000	0.9872132	0.9745900	5.1270488

----- TRT=6---50_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.5100000	0.0427395	1.3500000	1.6000000	0.1046900	0.0109600	6.9331138
RT3	6	9.6800000	0.2247369	9.2500000	10.7600000	0.5504907	0.3030400	5.6868873
T3	6	70.6916667	2.4107612	64.0200000	79.3700000	5.9051348	34.8706167	8.3533676
T4	6	4.0816667	0.0760446	3.9000000	4.3900000	0.1862704	0.0346967	4.5635871
TSH	6	31.1450000	1.2061613	25.1800000	32.9400000	2.9544796	8.7289500	9.4862085

1

The SAS System

17:12 Tuesday, October 6, 1998 6

----- TRT=7--125_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.8883333	0.0645196	1.6200000	2.1100000	0.1580401	0.0249767	8.3692893
RT3	6	10.7400000	0.3656045	9.0000000	11.3900000	0.8955445	0.8020000	8.3384034
T3	6	68.5466667	1.3929481	62.7200000	73.3000000	3.4120121	11.6418267	4.9776485
T4	6	3.2483333	0.1121730	2.8400000	3.4900000	0.2747666	0.0754967	8.4586937
TSH	6	22.9050000	0.9031713	20.0300000	26.6200000	2.2123087	4.8943100	9.6586280

----- TRT=7--125_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	1.7816667	0.0501609	1.5500000	1.9000000	0.1228685	0.0150967	6.8962672
RT3	6	11.2066667	0.3329631	10.6400000	12.7600000	0.8155898	0.6651867	7.2777195
T3	6	66.4633333	1.4957577	61.8600000	71.0300000	3.6638432	13.4237467	5.5125781
T4	6	3.4283333	0.0989416	3.1000000	3.7000000	0.2423565	0.0587367	7.0692218
TSH	6	33.9600000	1.2495759	28.4600000	37.1300000	3.0608234	9.3686400	9.0130254

----- TRT=8--250_mg/kg/day SEX=F -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	2.3216667	0.0411839	2.1800000	2.4800000	0.1008795	0.0101767	4.3451313
RT3	6	10.6633333	0.4420684	9.1600000	12.3300000	1.0828419	1.1725467	10.1548166
T3	6	66.4016667	1.4409382	60.6100000	70.2100000	3.5295632	12.4578167	5.3154739
T4	6	2.9216667	0.1172296	2.4800000	3.2900000	0.2871527	0.0824567	9.8283864
TSH	6	29.9250000	0.5171122	27.4800000	31.1500000	1.2666610	1.6044300	4.2327852

----- TRT=8--250_mg/kg/day SEX=M -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	6	2.1716667	0.0887850	1.9800000	2.4600000	0.2174780	0.0472967	10.0143347
RT3	6	11.0716667	0.4393815	10.2200000	13.1800000	1.0762605	1.1583367	9.7208535
T3	6	65.9350000	2.0810378	59.7800000	73.8200000	5.0974808	25.9843100	7.7310696
T4	6	2.9600000	0.0925203	2.6900000	3.2600000	0.2266274	0.0513600	7.6563327
TSH	6	37.4433333	1.3784911	33.3800000	43.4400000	3.3765999	11.4014267	9.0178934

1

The SAS System

17:12 Tuesday, October 6, 1998 7

TRT=1-----CONTROL-----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	0.7716667	0.0276842	0.6500000	0.9200000	0.0959008	0.0091970	12.4277537
RT3	12	8.1458333	0.0975880	7.7700000	8.9800000	0.3380548	0.1142811	4.1500336
T3	12	130.6875000	2.9469049	110.6800000	141.5400000	10.2083781	104.2109841	7.8112889
T4	12	5.0600000	0.0925727	4.4900000	5.4400000	0.3206811	0.1028364	6.3375710
TSH	12	12.8608333	0.5435301	10.7100000	16.6900000	1.8828434	3.5450992	14.6401352

TRT=2-1.25_mg/kg/day-----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.0783333	0.0484116	0.8100000	1.3500000	0.1677028	0.0281242	15.5520408
RT3	12	8.6575000	0.1103584	8.2200000	9.5400000	0.3822927	0.1461477	4.4157404
T3	12	104.3083333	6.4854036	75.7000000	137.8900000	22.4660972	504.7255242	21.5381614
T4	12	4.6050000	0.0710900	4.1300000	4.9100000	0.2462630	0.0606455	5.3477303
TSH	12	14.0366667	0.4684538	11.7100000	16.7000000	1.6227717	2.6333879	11.5609475

TRT=3----5_mg/kg/day-----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.1575000	0.0336003	0.9900000	1.4100000	0.1163947	0.0135477	10.0556980
RT3	12	8.9491667	0.1250422	8.4800000	10.1100000	0.4331588	0.1876265	4.8402134
T3	12	94.8700000	3.7189578	79.0100000	114.2400000	12.8828477	165.9677636	13.5794747
T4	12	4.3908333	0.0843375	4.0300000	4.7800000	0.2921537	0.0853538	6.6537189
TSH	12	15.7508333	0.4076159	13.5800000	17.7700000	1.4120228	1.9938083	8.9647497

TRT=4-12.5_mg/kg/day-----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.2783333	0.0254901	1.1600000	1.4300000	0.0883005	0.0077970	6.9074669
RT3	12	9.2166667	0.1012223	8.4500000	9.7500000	0.3506444	0.1229515	3.8044603
T3	12	85.5691667	2.5568246	76.1600000	99.3300000	8.8571003	78.4482265	10.3508082
T4	12	4.1350000	0.0754030	3.7500000	4.5300000	0.2612035	0.0682273	6.3168926
TSH	12	17.8033333	0.8584979	12.5400000	22.8800000	2.9739240	8.8442242	16.7043103

1

The SAS System

17:12 Tuesday, October 6, 1998 8

----- TRT=5---25_mg/kg/day -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.4200000	0.0269680	1.2600000	1.5700000	0.0934199	0.0087273	6.5788643
RT3	12	9.7883333	0.2629461	8.6200000	11.8700000	0.9108720	0.8296879	9.3056909
T3	12	77.3575000	1.8261639	68.5500000	88.6100000	6.3260172	40.0184932	8.1776391
T4	12	4.0225000	0.0599763	3.7500000	4.2600000	0.2077641	0.0431659	5.1650484
TSH	12	23.8100000	2.0110287	16.7700000	32.8200000	6.9664077	48.5308364	29.2583272

----- TRT=6---50_mg/kg/day -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.5008333	0.0319436	1.3200000	1.6200000	0.1106558	0.0122447	7.3729545
RT3	12	10.1100000	0.2911394	8.8700000	11.8500000	1.0085363	1.0171455	9.9756310
T3	12	71.2758333	1.2551364	64.0200000	79.3700000	4.3479200	18.9044083	6.1001321
T4	12	3.9091667	0.0699292	3.5100000	4.3900000	0.2422417	0.0586811	6.1967616
TSH	12	25.2000000	1.8922369	18.0200000	32.9400000	6.5549010	42.9667273	26.0115120

----- TRT=7---125_mg/kg/day -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	1.8350000	0.0421487	1.5500000	2.1100000	0.1460075	0.0213182	7.9568105
RT3	12	10.9733333	0.2460178	9.0000000	12.7600000	0.8522306	0.7262970	7.7663784
T3	12	67.5050000	1.0237657	61.8600000	73.3000000	3.5464284	12.5771545	5.2535789
T4	12	3.3383333	0.0762952	2.8400000	3.7000000	0.2642944	0.0698515	7.9169557
TSH	12	28.4325000	1.8214917	20.0300000	37.1300000	6.3098323	39.8139841	22.1923233

----- TRT=8---250_mg/kg/day -----

Variable	N	Mean	Std Error	Minimum	Maximum	Std Dev	Variance	CV
HTG	12	2.2466667	0.0518496	1.9800000	2.4800000	0.1796124	0.0322606	7.9946162
RT3	12	10.8675000	0.3034477	9.1600000	13.1800000	1.0511736	1.1049659	9.6726348
T3	12	66.1683333	1.2087558	59.7800000	73.8200000	4.1872530	17.5330879	6.3281827
T4	12	2.9408333	0.0714298	2.4800000	3.2900000	0.2474399	0.0612265	8.4139390
TSH	12	33.6841667	1.3331590	27.4800000	43.4400000	4.6181981	21.3277538	13.7102935

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WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS

17:12 Tuesday, October 6, 1998 9

General Linear Models Procedure
Class Level Information**Class** **Levels** **Values**

SEX 2 F M

TRT 8 1-----CONTROL 2-1.25_mg/kg/day 3---5_mg/kg/day 4-12.5_mg/kg/day 5---25_mg/kg/day 6---50_mg/kg/day
7--125_mg/kg/day 8--250_mg/kg/day

Number of observations in data set = 96

1

WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS

17:12 Tuesday, October 6, 1998 10

General Linear Models Procedure

Dependent Variable: HTG

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	18.34449583	1.22296639	100.72	0.0001
Error	80	0.97140000	0.01214250		
Corrected Total	95	19.31589583			
		R-Square	C.V.	Root MSE	HTG Mean
		0.949710	7.809338	0.11019301	1.41104167
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SEX	1	0.01706667	0.01706667	1.41	0.2393
TRT	7	17.85051250	2.55007321	210.01	0.0001
SEX*TRT	7	0.47691667	0.06813095	5.61	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	0.01706667	0.01706667	1.41	0.2393
TRT	7	17.85051250	2.55007321	210.01	0.0001
SEX*TRT	7	0.47691667	0.06813095	5.61	0.0001

1 WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS 17:12 Tuesday, October 6, 1998 11

General Linear Models Procedure

Dependent Variable: RT3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	92.29692917	6.15312861	11.51	0.0001
Error	80	42.76986667	0.53462333		
Corrected Total	95	135.06679583			
		R-Square	C.V.	Root MSE	RT3 Mean
		0.683343	7.625554	0.73117941	9.58854167
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SEX	1	0.08401667	0.08401667	0.16	0.6928
TRT	7	88.32666250	12.61809464	23.60	0.0001
SEX*TRT	7	3.88625000	0.55517857	1.04	0.4112
Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	0.08401667	0.08401667	0.16	0.6928
TRT	7	88.32666250	12.61809464	23.60	0.0001
SEX*TRT	7	3.88625000	0.55517857	1.04	0.4112

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WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS

17:12 Tuesday, October 6, 1998 12

General Linear Models Procedure

Dependent Variable: T3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	47579.87509583	3171.99167306	65.09	0.0001
Error	80	3898.62680000	48.73283500		
Corrected Total	95	51478.50189583			
		R-Square	C.V.	Root MSE	T3 Mean
		0.924267	8.003983	6.98089070	87.21770833
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SEX	1	1710.95706667	1710.95706667	35.11	0.0001
TRT	7	41112.25982917	5873.17997560	120.52	0.0001
SEX*TRT	7	4756.65820000	679.52260000	13.94	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	1710.95706667	1710.95706667	35.11	0.0001
TRT	7	41112.25982917	5873.17997560	120.52	0.0001
SEX*TRT	7	4756.65820000	679.52260000	13.94	0.0001

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WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS

17:12 Tuesday, October 6, 1998 13

General Linear Models Procedure

Dependent Variable: T4

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	41.11236250	2.74082417	63.68	0.0001
Error	80	3.44343333	0.04304292		
Corrected Total	95	44.55579583			
		R-Square	C.V.	Root MSE	T4 Mean
		0.922716	5.122400	0.20746787	4.05020833
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SEX	1	2.04166667	2.04166667	47.43	0.0001
TRT	7	38.50592917	5.50084702	127.80	0.0001
SEX*TRT	7	0.56476667	0.08068095	1.87	0.0847
Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	2.04166667	2.04166667	47.43	0.0001
TRT	7	38.50592917	5.50084702	127.80	0.0001
SEX*TRT	7	0.56476667	0.08068095	1.87	0.0847

1

WPAFB 14-DAY PERCHLORATE - ALL VARIABLES
PROC GLM - SEX BY TRT INTERACTIONS

17:12 Tuesday, October 6, 1998 14

General Linear Models Procedure

Dependent Variable: TSH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	6297.25712917	419.81714194	120.02	0.0001
Error	80	279.82276667	3.49778458		
Corrected Total	95	6577.07989583			
		R-Square	C.V.	Root MSE	TSH Mean
		0.957455	8.720152	1.87023650	21.44729167
Source	DF	Type I SS	Mean Square	F Value	Pr > F
SEX	1	1164.54801667	1164.54801667	332.94	0.0001
TRT	7	4710.86586250	672.98083750	192.40	0.0001
SEX*TRT	7	421.84325000	60.26332143	17.23	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
SEX	1	1164.54801667	1164.54801667	332.94	0.0001
TRT	7	4710.86586250	672.98083750	192.40	0.0001
SEX*TRT	7	421.84325000	60.26332143	17.23	0.0001

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WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 15

SEX=F -----

General Linear Models Procedure
Class Level Information

Class Levels Values

TRT	8	1-----CONTROL 2-1.25_mg/kg/day 3----5_mg/kg/day 4-12.5_mg/kg/day 5---25_mg/kg/day 6---50_mg/kg/day 7--125_mg/kg/day 8--250_mg/kg/day
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Number of observations in by group = 48

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 16
 PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=F -----

General Linear Models Procedure

Dependent Variable: HTG

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	11.43186458	1.63312351	156.44	0.0001
Error	40	0.41758333	0.01043958		
Corrected Total	47	11.84944792			
		R-Square	C.V.	Root MSE	HTG Mean
		0.964759	7.310129	0.10217428	1.39770833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	11.43186458	1.63312351	156.44	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	11.43186458	1.63312351	156.44	0.0001

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 17
 PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=F -----

General Linear Models Procedure

Dependent Variable: T3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	16214.69963125	2316.38566161	67.65	0.0001
Error	40	1369.60471667	34.24011792		
Corrected Total	47	17584.30434792			
		R-Square	C.V.	Root MSE	T3 Mean
		0.922112	7.050343	5.85150561	82.99604167

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	16214.69963125	2316.38566161	67.65	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	16214.69963125	2316.38566161	67.65	0.0001

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT 17:12 Tuesday, October 6, 1998 18

----- SEX=F -----

General Linear Models Procedure

Dependent Variable: TSH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	1541.45789792	220.20827113	144.38	0.0001
Error	40	61.00928333	1.52523208		
Corrected Total	47	1602.46718125			

R-Square	C.V.	Root MSE	TSH Mean
0.961928	6.874733	1.23500287	17.96437500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	1541.45789792	220.20827113	144.38	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	1541.45789792	220.20827113	144.38	0.0001

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 19

SEX=F -----

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: HTG

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 0.01044
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 0.1886

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	TRT
A	2.32167	6	8--250_mg/kg/day
B	1.88833	6	7--125_mg/kg/day
C	1.49167	6	6---50_mg/kg/day
C	1.42667	6	5---25_mg/kg/day
C	1.32500	6	4-12.5_mg/kg/day
D	1.09833	6	3----5_mg/kg/day
D	0.93167	6	2-1.25_mg/kg/day
E	0.69833	6	1-----CONTROL

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 20

SEX=F

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: T3

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 34.24012
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 10.799

Means with the same letter are not significantly different.

Tukey Grouping		Mean	N	TRT
	A	128.510	6	1-----CONTROL
	B	84.598	6	2-1.25_mg/kg/day
	B	84.073	6	3----5_mg/kg/day
C	B	80.678	6	4-12.5_mg/kg/day
C	B			
C	D	79.300	6	5---25_mg/kg/day
C	E	71.860	6	6---50_mg/kg/day
	D			
	E	68.547	6	7--125_mg/kg/day
	E			
		66.402	6	8--250_mg/kg/day

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 21

SEX=F

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: TSH

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 1.525232
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 2.2792

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	TRT
A	29.9250	6	8--250_mg/kg/day
B	22.9050	6	7--125_mg/kg/day
C	19.2550	6	6---50_mg/kg/day
D C	17.3867	6	5---25_mg/kg/day
D E	15.3567	6	4-12.5_mg/kg/day
F E	14.5850	6	3----5_mg/kg/day
F G	13.0533	6	2-1.25_mg/kg/day
G	11.2483	6	1-----CONTROL

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 22

----- SEX=M -----

General Linear Models Procedure
Class Level Information

Class Levels Values

TRT 8 1-----CONTROL 2-1.25_mg/kg/day 3----5_mg/kg/day 4-12.5_mg/kg/day 5---25_mg/kg/day 6---50_mg/kg/day
7--125_mg/kg/day 8--250_mg/kg/day

Number of observations in by group = 48

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
 PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 23

----- SEX=M -----

General Linear Models Procedure

Dependent Variable: HTG

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	6.89556458	0.98508065	71.15	0.0001
Error	40	0.55381667	0.01384542		
Corrected Total	47	7.44938125			
		R-Square	C.V.	Root MSE	HTG Mean
		0.925656	8.260925	0.11766655	1.42437500
Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	6.89556458	0.98508065	71.15	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	6.89556458	0.98508065	71.15	0.0001

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 24
 PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=M -----

General Linear Models Procedure

Dependent Variable: T3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	29654.21839792	4236.31691399	67.00	0.0001
Error	40	2529.02208333	63.22555208		
Corrected Total	47	32183.24048125			
		R-Square	C.V.	Root MSE	T3 Mean
		0.921418	8.695871	7.95144968	91.43937500

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	29654.21839792	4236.31691399	67.00	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	29654.21839792	4236.31691399	67.00	0.0001

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 25
 PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=M -----

General Linear Models Procedure

Dependent Variable: TSH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	3591.25121458	513.03588780	93.79	0.0001
Error	40	218.81348333	5.47033708		
Corrected Total	47	3810.06469792			
		R-Square	C.V.	Root MSE	TSH Mean
		0.942570	9.381691	2.33887517	24.93020833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	3591.25121458	513.03588780	93.79	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	3591.25121458	513.03588780	93.79	0.0001

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 26
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=M -----

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: HTG

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 0.013845
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 0.2172

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	TRT
A	2.17167	6	8--250_mg/kg/day
B	1.78167	6	7--125_mg/kg/day
C	1.51000	6	6---50_mg/kg/day
C			
D C	1.41333	6	5---25_mg/kg/day
D	1.23167	6	4-12.5_mg/kg/day
D	1.22500	6	2-1.25_mg/kg/day
D	1.21667	6	3----5_mg/kg/day
E	0.84500	6	1-----CONTROL

1

WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 27

SEX=M

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: T3

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 63.22555
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 14.674

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	TRT
A	132.865	6	1-----CONTROL
A	124.018	6	2-1.25_mg/kg/day
B	105.667	6	3----5_mg/kg/day
C	90.460	6	4-12.5_mg/kg/day
D	75.415	6	5---25_mg/kg/day
D	70.692	6	6---50_mg/kg/day
D	66.463	6	7--125_mg/kg/day
D	65.935	6	8--250_mg/kg/day

1 WPAFB 14-DAY PERCHLORATE K0799 - hTg, T3 AND TSH DATA 17:12 Tuesday, October 6, 1998 28
PROC GLM - STEPDOWN ANOVAS BY SEX - MAIN EFFECT OF TRT

----- SEX=M -----

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: TSH

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 40 MSE= 5.470337
Critical Value of Studentized Range= 4.521
Minimum Significant Difference= 4.3164

Means with the same letter are not significantly different.

Tukey Grouping		Mean	N	TRT
	A	37.443	6	8--250_mg/kg/day
	A	33.960	6	7--125_mg/kg/day
B	B	31.145	6	6---50_mg/kg/day
B	B	30.233	6	5---25_mg/kg/day
	C	20.250	6	4-12.5_mg/kg/day
D	C	16.917	6	3----5_mg/kg/day
D	D	15.020	6	2-1.25_mg/kg/day
D	D	14.473	6	1-----CONTROL

1

WPAFB 90-DAY PERCHLORATE K0799 - rT3 and T4 DATA
PROC GLM - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 29

General Linear Models Procedure
Class Level Information

Class Levels Values

TRT 8 1-----CONTROL 2-1.25_mg/kg/day 3---5_mg/kg/day 4-12.5_mg/kg/day 5---25_mg/kg/day 6---50_mg/kg/day
7--125_mg/kg/day 8--250_mg/kg/day

Number of observations in data set = 96

1

WPAFB 90-DAY PERCHLORATE K0799 - rT3 and T4 DATA
PROC GLM - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 30

General Linear Models Procedure

Dependent Variable: RT3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	88.32666250	12.61809464	23.76	0.0001
Error	88	46.74013333	0.53113788		
Corrected Total	95	135.06679583			
R-Square		C.V.	Root MSE	RT3 Mean	
0.653948		7.600656	0.72879207	9.58854167	
Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	88.32666250	12.61809464	23.76	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	88.32666250	12.61809464	23.76	0.0001

1 WPAFB 90-DAY PERCHLORATE K0799 - rT3 and T4 DATA 17:12 Tuesday, October 6, 1998 31

PROC GLM - MAIN EFFECT OF TRT
General Linear Models Procedure

Dependent Variable: T4

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	38.50592917	5.50084702	80.01	0.0001
Error	88	6.04986667	0.06874848		
Corrected Total	95	44.55579583			
		R-Square	C.V.	Root MSE	T4 Mean
		0.864218	6.473724	0.26219932	4.05020833
Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	38.50592917	5.50084702	80.01	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	38.50592917	5.50084702	80.01	0.0001

1

WPAFB 90-DAY PERCHLORATE K0799 - RT3 and T4 DATA
PROC GLM - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 32

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: RT3

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 88 MSE= 0.531138
Critical Value of Studentized Range= 4.391
Minimum Significant Difference= 0.9238

Means with the same letter are not significantly different.

Tukey Grouping		Mean	N	TRT
	A	10.9733	12	7--125_mg/kg/day
	A	10.8675	12	8--250_mg/kg/day
	A	10.1100	12	6---50_mg/kg/day
B	A	9.7883	12	5---25_mg/kg/day
B	C	9.2167	12	4-12.5_mg/kg/day
B	C D	8.9492	12	3----5_mg/kg/day
E	C D	8.6575	12	2-1.25_mg/kg/day
E	D	8.1458	12	1-----CONTROL

1

WPAFB 90-DAY PERCHLORATE K0799 - rT3 and T4 DATA
PROC GLM - MAIN EFFECT OF TRT

17:12 Tuesday, October 6, 1998 33

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: T4

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.05 df= 88 MSE= 0.068748
Critical Value of Studentized Range= 4.391
Minimum Significant Difference= 0.3324

Means with the same letter are not significantly different.

Tukey Grouping		Mean	N	TRT
	A	5.0600	12	1-----CONTROL
	B	4.6050	12	2-1.25_mg/kg/day
C	B	4.3908	12	3----5_mg/kg/day
C	D	4.1350	12	4-12.5_mg/kg/day
	D	4.0225	12	5---25_mg/kg/day
	D	3.9092	12	6---50_mg/kg/day
	E	3.3383	12	7--125_mg/kg/day
	F	2.9408	12	8--250_mg/kg/day